CERTIFIED CROP ADVISER

Nutrient Recommendation Philosophies

By Dale Cowan, *CCA-ON*

We are in a science based industry that uses technology and science to seek production efficiencies that increase profitability, reduce costs and meet compliance issues in a documented and defendable manner. Why then do we talk about recommendation philosophy, why are we not definitive in using science to come up with a single recommendation if we are so steeply science based?

In a perfect world we would all have sandy loam soil, weekly rain, no compaction, uniform emergence, top yielding varieties, no diseases, no bugs, no leaching, no runoff, excellent drainage, uniform landscape, and deep topsoil. We would all plant our crops early, harvest under ideal conditions, control weeds in a single a pass, all think the same, have the same knowledge base, and be willing to take the same risks. We all know we are not always perfect.

The current recommendation philosophies are Sufficiency, Crop Removal and Maintenance, and Base Saturation or Cation Balance. The reason for the existence of these philosophies is because of regional developments and research specific to the areas where the research was conducted. Researchers working in specific geographic areas in North America developed soil test methods and calibration trials in these areas to reflect the uniqueness of these geographies and crops grown there. Soil test values were calibrated to crop response and a series of charts, tables or formulae where developed so industry could interpret the results of soil tests into fertilizer recommendations for farmers.

What is sometimes lost in the translation is the importance of understanding how unique some of the recommendations are to the specific areas and not all research results are universally translated from one area to the next.

Sufficiency Recommendation Method of fertilizer recommendations is the current OMAF method using the Accredited Test of Sodium Bicarbonate extraction for P and Ammonium Acetate for the cations of K and Mg. Recommendations are based on calibration trials correlated to soil test results to recommend sufficient nutrients to give maximum economic yield response. It requires a series of fertility rate trials to measure crop response to additional nutrients. The published recommendation tables assume above average management and that fields have no major limiting factors. Over the past 20 years, field level demonstrations (in Ontario) and rate comparisons have supported the original calibration work. Yield goals are not included for P and K as the recommended rate is based on response to applied nutrients. Higher yielding fields have features that allow high yields because of greater root massing and a well structure soil. Fields which respond to higher than recommended rates usually have a high spatial variability. More detailed sampling of management zones may offer site-specific recommendation.

Since the calibrations are based on the average response (that can be quite variable) from a large number of trials, you could expect that the response in your situation may be quite different (than the average) and therefore you risk under-fertilizing your crop under optimal growing conditions more than with the other approaches.

Crop Removal and Soil Test Maintenance is designed to use the soil test levels to calculate the additional nutrients required to meet a specified nutrient level and or additional nutrients to cover those lost in the harvested portion removed from the field.

One of the greatest impacts of man on the soil is the elevated levels of nutrients resulting from land management practices.

Throughout North America an increasingly greater number of fields are testing high to very high in P and K. In Ontario, the average soil test level for P has increased in the last 10 years from 26 to 38 ppm. The Nutrient Management Plans allow for the application of nutrients to high testing soils but at a rate to match crop removal. Currently, the NMan software program calculates removal rates based on crop yields it also recognizes that it takes 35 pounds of P2O5 to increase the soil test 1 ppm and 19 pounds of K2O to raise the K test 1 ppm.

Cation Balance uses the soil test results to calculate the ratios or saturations of the basic cations of K, Mg, and Ca.

The researchers who developed this approach observed in their data the saturation of the Cation Exchange Capacity (CEC) of 5, 10. 65 % of K, Mg, and Ca produced the higher yields. This approach has been challenged on numerous occasions. There are many fields that do not fall into these ratios and still produce high yields. When these fields are subjected to fertilizer applications in an effort to balance them, the result is no improvement in yield and higher cost of production. It is realized that high Cation Exchange Capacity soils with high levels of Exchangeable Calcium and Magnesium do not respond to the saturation balance method readily. A further spin on this method is to express the saturation ratios Ca:Mg, Ca:K, Mg:K, as being ideal at 6.5, 13, and 2 respectively. The ratios on world record corn fields in 1973 were 4, 23, 6 and in 1979 were 3, 18 and 5 so you can see a wide deviation from the ideal ratio and still produce world record yields. However in some soils these ratios are important especially in sandier low CEC fields. Excessive rates of potash can induce a magnesium deficiency as can an application of calcitic lime in a low testing magnesium soil. The ratios do offer some guidelines in preventing over application and a method to calculate the correcting balance. In horticulture crops with the increase use of fertigation the need to watch low testing calcium sandy soil is more critical as moisture has been removed as a limiting factor.

Summary

There is definitely science involved in determining fertilizer recommendations from research and calibration trials. There is also an art to implementing these recommendations into a farm cropping system. There are many factors operating in a cropping system, we can also appreciate that crop growth is conditioned by many stresses. Balancing the science and the art of implementing, managing input factors and assessing their impact requires knowledge and skill. Your Certified Crop Advisor is skilled in these areas and is well networked through the industry to assist you in assessing your nutrient management options.

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There are over 500 Certified Crop Advisers (CCA) in Ontario. Each CCA has demonstrated their knowledge about Ontario crop production by passing the required exams. In addition, they have the crop advisory experience, the education, the commitment to continuing education and have signed a comprehensive code of ethics, which places the grower's interests first.

This industry driven program helps ensure that Ontario crop producers are well served by those providing their crop production advice. This article was written by one of those CCA's.